

## SECOND GRADE: CHANGES OF PROPERTIES

### Standards Bundle

*Standards are listed within the bundle. Bundles are created with potential instructional use in mind, based upon potential for related phenomena that can be used throughout a unit.*

2-PS1-1 Plan and carry out an investigation to describe and classify different kinds of materials by their observable properties. (SEP:3; DCI: PS1.A; CC: Patterns) [Clarification Statement: Observations could include color, texture, hardness, and flexibility. Patterns could include the similar properties that different materials share.]

2-PS1-2 Analyze data obtained from testing different materials to determine which materials have the properties that are best suited for an intended purpose. (SEP:4; DCI: PS1.A; CCC: Cause/Effect, Technology) [Clarification Statement: Examples of properties could include, strength, flexibility, hardness, texture, and absorbency.] [Assessment Boundary: Assessment of quantitative measurements is limited to length.]

2-PS1-3 Construct an evidence-based account of how an object made of a small set of pieces can be disassembled and made into a new object. (SEP: 6; DCI: PS1.A; CCC: Energy/Matter) [Clarification Statement: Examples of pieces could include blocks, building bricks, or other assorted small objects.]

2-PS1-4 Construct an argument using reasoning and evidence that some changes caused by heating or cooling can be reversed and some cannot. (SEP: 7; DCI: PS1.B; CCC: Cause/Effect) [Clarification Statement: Examples of reversible changes could include materials such as water and butter at different temperatures. Examples of irreversible changes could include cooking an egg, freezing a plant leaf, and heating paper.]

### Content Overview

*This section provides a generic overview of the content or disciplinary core ideas as an entry point to the standards.*

Matter is all around us and can exist in different states such as solids, liquids, and gases. States are determined by changes in temperature. Sometimes these changes can be reversed by heating and cooling. Students can analyze and observe the changes of matter due to temperature to understand why they are changing states. Materials have different properties such as hardness and textures which help determine how this material could be used. Objects are sometimes made from many small pieces that each have their own properties. These pieces can be assembled and disassembled to create a new object.

### Phenomena

*Phenomena can be used at varying levels of instruction. One could be used to anchor an entire unit, while another might be more supplemental for anchoring just a unit. Please remember that phenomena should allow students to engage in the SEP and use the CCC/DCI to understand and explain the phenomenon.*

- I used to have ice in my glass of water.

- There are many different kinds of string. (thread, fishing line, yarn, rope, etc.)
- I want to go on a bike ride but I only have 3 broken bikes.
- I keep slipping on the ice. Mom told me to get different shoes.
- Paper can be recycled.
- I put a chocolate bar in my pocket before recess, but now it's all gooey!

### Storyline

*This section aims to decode not only the DCI connections, but also the SEP and CCC in a detailed account of how they possibly fit together in a progression for student learning, including both rationale and context for the bundle.*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Planning and Carrying Out Investigations</b></p> <ul style="list-style-type: none"> <li>• Plan and conduct an investigation collaboratively to produce data to serve as the basis for evidence to answer a question.</li> </ul> <p><b>Analyzing and Interpreting Data</b></p> <ul style="list-style-type: none"> <li>• Analyze data from tests of an object or tool to determine if it works as intended.</li> </ul> <p><b>Constructing Explanations and Designing Solutions</b></p> <ul style="list-style-type: none"> <li>• Make observations (firsthand or from media) to construct an evidence-based account for natural phenomena.</li> </ul> <p><b>Engaging in Argument from Evidence</b></p> <ul style="list-style-type: none"> <li>• Construct an argument with evidence to support a claim.</li> </ul>	<p><b>PS1.A: Structure and Properties of Matter</b></p> <ul style="list-style-type: none"> <li>• Different kinds of matter exist and many of them can be either solid or liquid, depending on temperature. Matter can be described and classified by its observable properties.</li> <li>• Different properties are suited to different purposes.</li> <li>• A great variety of objects can be built up from a small set of pieces.</li> </ul> <p><b>PS1.B: Chemical Reactions</b></p> <ul style="list-style-type: none"> <li>• Heating or cooling a substance may cause changes that can be observed. Sometimes these changes are reversible, and sometimes they are not.</li> </ul>	<p><b>Patterns</b></p> <ul style="list-style-type: none"> <li>• Patterns in the natural and human designed world can be observed.</li> </ul> <p><b>Cause and Effect</b></p> <ul style="list-style-type: none"> <li>• Simple tests can be designed to gather evidence to support or refute student ideas about causes.</li> <li>• Events have causes that generate observable patterns.</li> </ul> <p><b>Energy and Matter</b></p> <ul style="list-style-type: none"> <li>• Objects may break into smaller pieces and be put together into larger pieces, or change shapes.</li> </ul>

Most matter is either a solid or liquid depending on the temperature. (Students at this grade level do not master the state of gases, however discussing it may help understand the overall concept.) Students may plan and conduct an investigation to make observations of different types of material being heated or cooled. Students will notice that heating and cooling can change the material's state of matter such as ice cubes or chocolate melting. Students can use evidence from these investigations to construct an argument that some of these changes can be reversed and some cannot.

All materials are made up of matter and have different properties. These properties, such as flexibility, texture, and hardness help us determine the purpose for which the material might be best suited. Students should gather data from observations about the properties of many different objects and discover patterns according to the properties. Students can then classify these patterns into categories such metals, which can be bent and shiny. Students can ask questions and propose ideas about how each type of material can be used based on its properties. Using these ideas, students can test to determine which materials are best suited for different purposes.

Through investigations of different materials, students should observe that some objects are made of smaller pieces, which creates a larger working system. These systems can be assembled and disassembled to make different systems. Students can use real life models, such as cars and clocks as examples to build their own system made of different manipulatives. Students will understand that objects can be taken apart into smaller pieces and sometimes can be put together in many ways to make objects different from the original object.

### **Formative Assessment**

*Formative assessment is crucial because all learners benefit from timely and focused feedback from others. It promotes self-reflection, self-explanation, and social learning. It can also make learning more relevant. Each of the questions below might be used throughout the formative assessment process. Specific prompts may focus on individual practices, core ideas, or crosscutting concepts, but, together, the components need to support inferences about students' three-dimensional science learning as described in a given bundle, standard or lesson-level performance expectation.*

### **Resources to inform your formative assessment.**

- <http://stemteachingtools.org/brief/30>
- <http://stemteachingtools.org/brief/41>
- <http://stemteachingtools.org/pd/sessionb>

### **SEP Planning and Carrying Out Investigations**

- What are the different ways in which we classify matter?
- Why does ice cream melt? Can you make it solid again?
- What causes a log to burn? Can we get it back again?

### **SEP Analyzing and Interpreting Data**

- Determine properties of matter and what purposes they would be best used for.

### CCC Cause and Effect

- Explain how heating and cooling matter effects its state.

### Performance Outcomes

*These are statements of how students use knowledge and are similar to the standards in how they blend DCI, SEP, and CCC, but at a smaller grain-size. These are potential outcomes for instruction as it plays out in lessons and activities in the classroom. It is important to also think of these as smaller outcomes that build toward the larger goal of mastering the standards.*

- **Make observations about materials** that have different observable properties of matter and *explain what causes these differences.*
- **Plan and conduct investigations** to determine that matter changes from a liquid to solid or solid to liquid are *by heating or cooling it.*
- **Analyze data** that shows different properties are suited for different purposes, notice *patterns in different objects properties.*
- **Explain** that some matter changes are *caused by heating or cooling.*